Level-2 Trigger Upgrade

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Per il gruppo italiano del trigger hardware

(Padova, Pisa, Frascati, Siena)

Overview

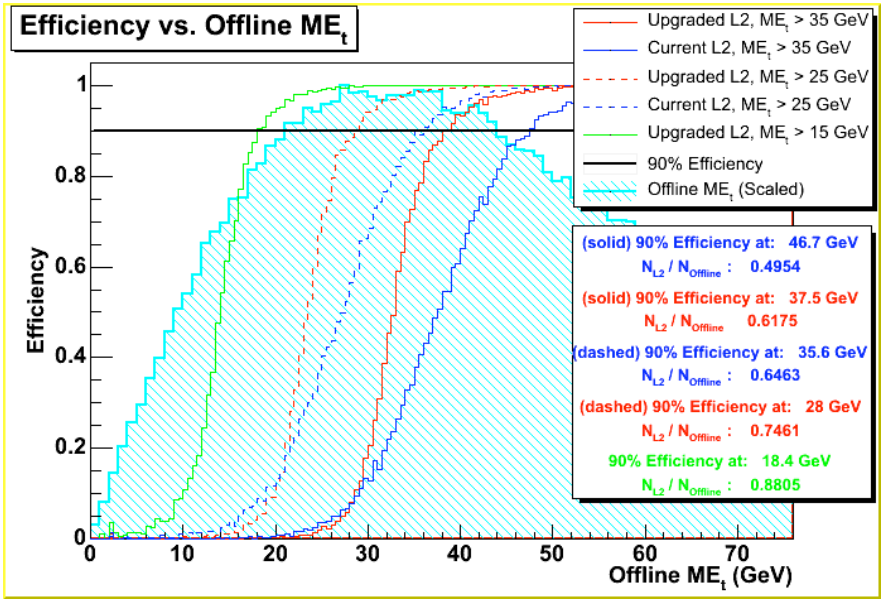
- Work done the last year.
- Italian responsibilities on Trigger
- Publications
- Projects ongoing
- New Ideas

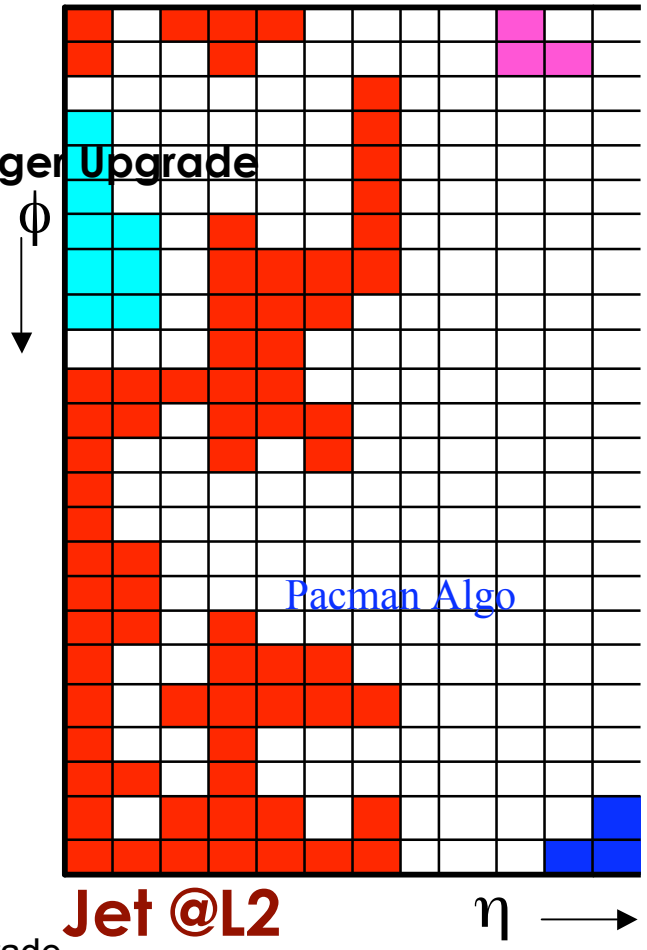
L2Cal: the beginning…

Few ideas and concerns:

- Jets will be merged due to Pacman effect at high lum
- Improving the trigger MET resolution by using 10 bits at L2 (instead of 8 provided by L1)

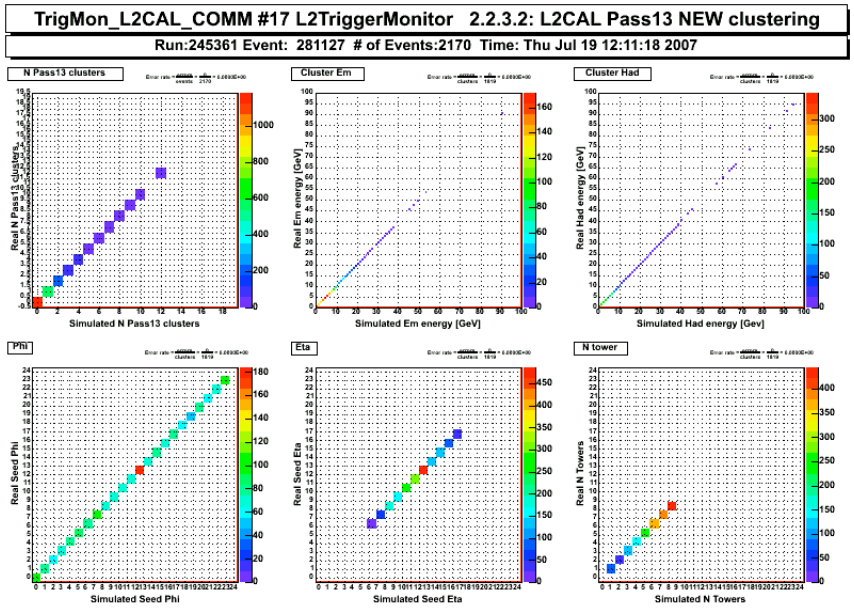
⇒Summer of '06 a case study was made
⇒Proposal(note 8415) for L2 Calorimeter Trigger Upgrade
⇒Start October 2006





L2Cal: Italian contribution

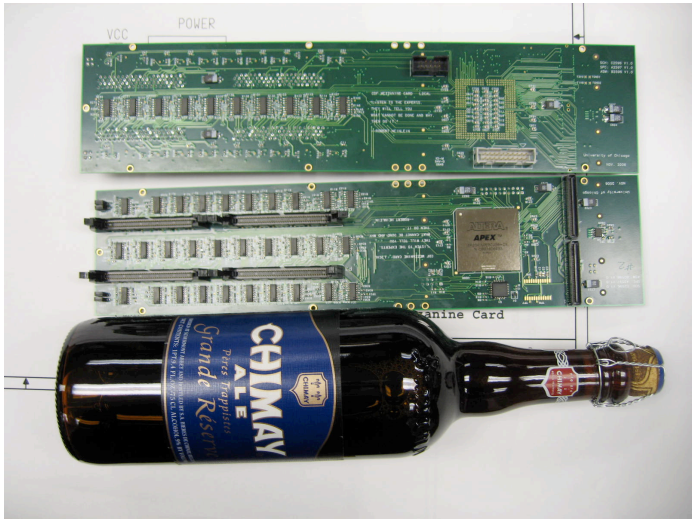
- A New Mezzanine to interface Pulsar with the LVDS cables from Dirac.
- Key Word: TEST!!! (LVDS cables, LVDS mezzanine, pulsars)



- Monitoring and feedback for hardware/firmware/software issues (Giorgio Cortiana)
- Readout code (Massimo Casarsa)
- L2CAL simulation (Simone Donati)

Hardware-firmware Team:

Marco Piendibene, Lucas Rogondino, Virginia Greco, Laura Sartori



Sign off

- Sign-Off in August, the 14th.
- Brian Winer, for the l2 Upgrade Review Committee:

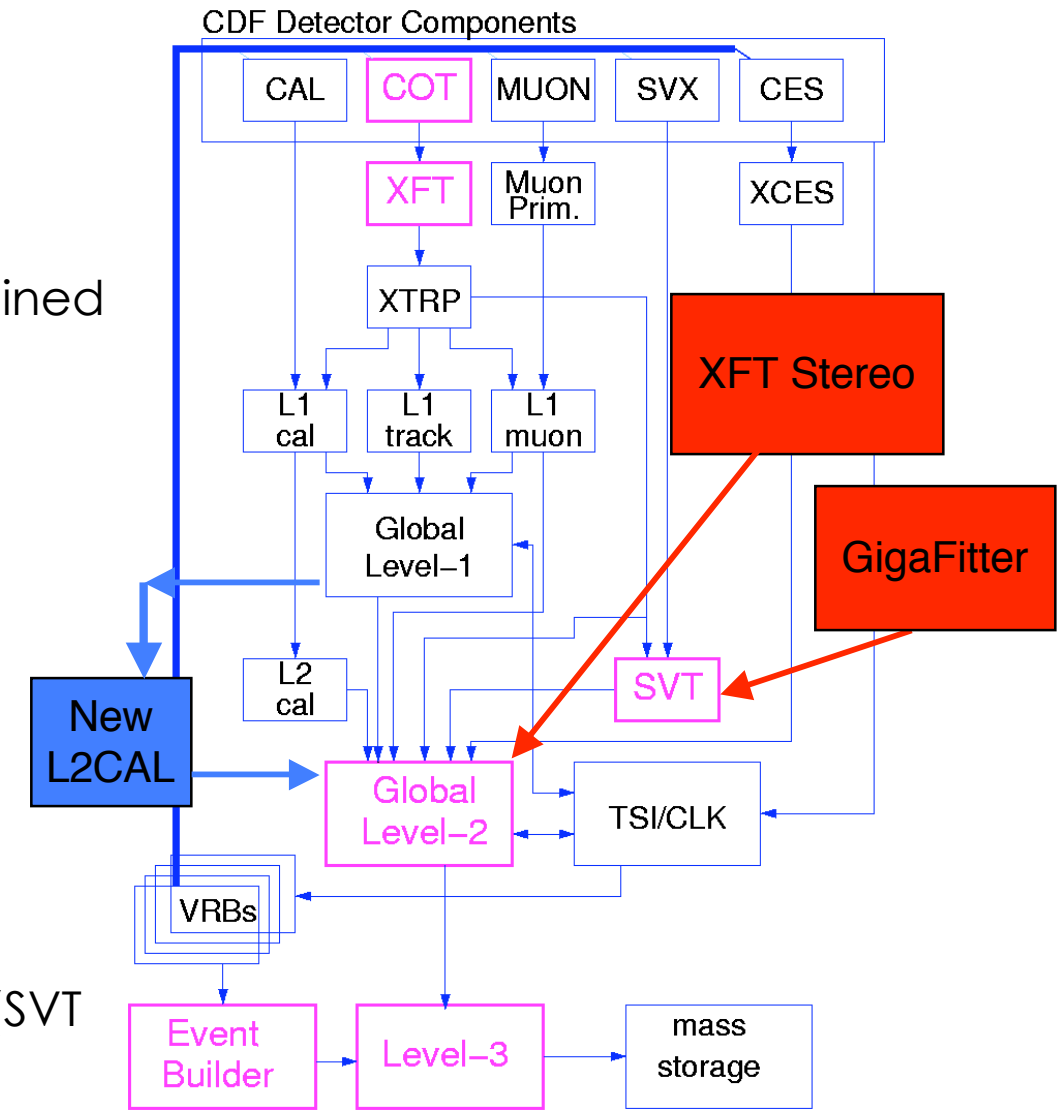
"*We want to congratulate all the people that worked to develop this system in such a short time. They have created a trigger system that is both robust and flexible and will serve CDF extremely well through the end of Run II*"

- Details (hardware and trigger efficiency) in the CDF Note 8940
- "Level-2 calorimeter trigger upgrade at CDF", L.Sartori for L2Cal team, 2006, San Diego, IEEE.
- "Level-2 calorimeter trigger upgrade at CDF", G.Flanagan for L2Cal team, 2007, Fermilab, Real Time IEEE.

- "A High Quality Exclusive trigger Selection for the HW Discovery Channel at CDF", M. Casarsa for **HTTF**, IEEE 2007 NSS.

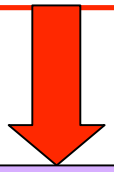
What next

- New responsibilities
  ⇒ L2 hardware trigger SPL (Laura Sartori)
- New people
  ⇒ Massimo Casarsa has joined to SVT team
- Increased know-how (mezzanines and pulsars technologies, monitoring, testing)
- "New" collaboration (XFT)
- New project (GigaFitter)
- Developing of new ideas (SVT Bypass, Met L1)



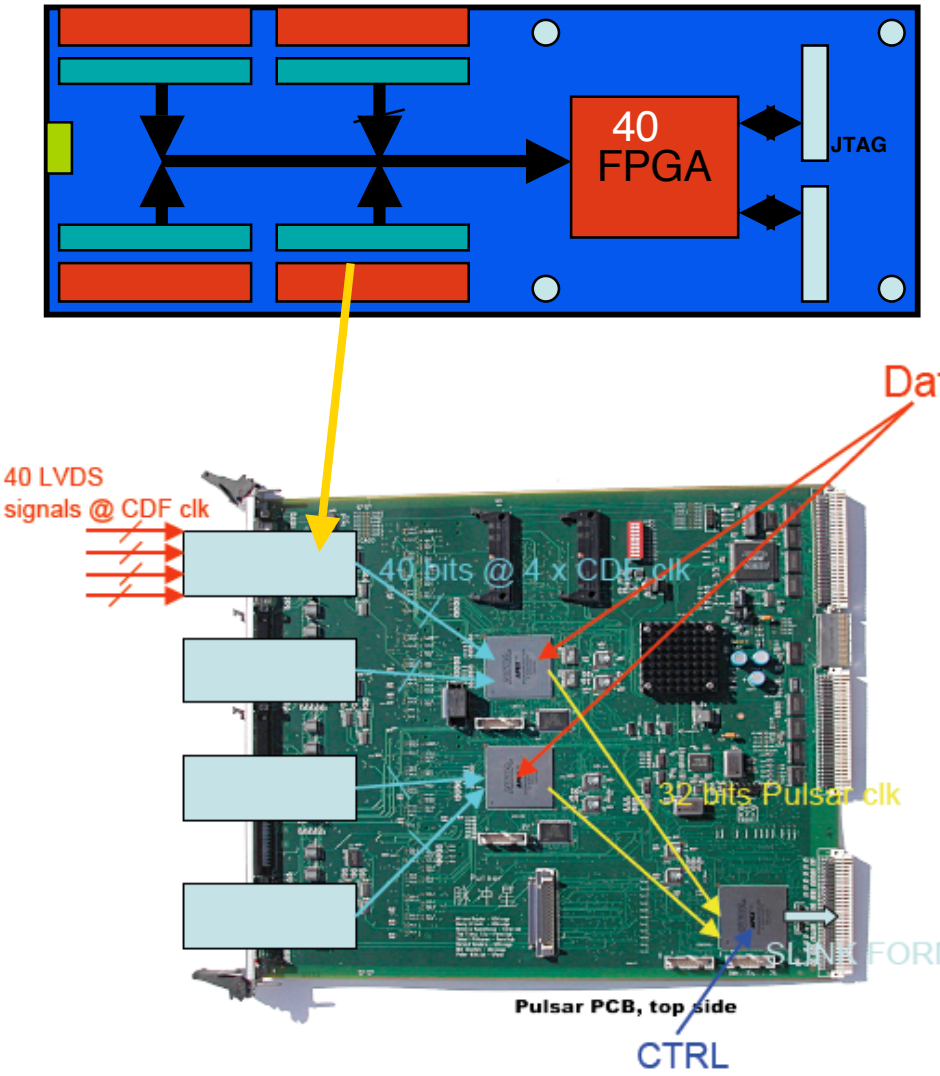
The GigaFitter project

Powerful FPGAs with faster multiplier devices (25x18 bits) ⇒ scalar products without using precalculated terms and using more constants.



- ✓ Faster track fits
- ✓ Larger Associative Memory size
  - ⇒ Lepton Forward Coverage
  - ⇒ Increased Pt acceptance
  - ⇒ Increased IP acceptance
- ✓ Increased efficiency (removing the 5/5 fake hits)

The GigaFitter System



4 wedge connectors on each mezzanine (l2cal-based)
→ possible up to 6x4=24 fits in parallel

3 mezzanines = 12 wedges
4th mezzanine → spare

Using a splitter board (already available) parasitic test in trigger room very easy to do.

If it works just promote the GF as the official one.

The GigaFitter Plan

- Project leader : Pierluigi Catastini (Siena)
- Firmware FPGA Development: Pierluigi+ Edoardo Bossini (Siena)
- Mezzanine Design: Electronic shop Padova
- System development, firmware, test: Pierluigi, Francesco Crescioli (PhD student)+ Virginia Greco - Pisa
- Monitoring: Padova
- Commissioning : Padova-Siena-Pisa

"The GigaFitter for fast Track Fitting based on FPGA DSP Arrays", P.Catastini for the SVT Collaboration, IEEE 2007 NSS Hawaii.

"The SVT Bypass for a Forward Lepton wide", L.Sartori for SVT collaboration, 2007, Fermilab, Real Time IEEE.

- "Online b-jects tagging at CDF", G.Cortiana for **HTTF**, 2007, Fermilab, Real Time IEEE.

XFT L2 Stereo Upgrade

The XFT L2 Stereo Upgrade will include stereo information in the level 2 trigger system (measure the angle of the track and distance from the center of the detector along the beam axis to point track to other detectors)

Data Volume (stereo pixel information) **from Pulsars to L2PC is one of the main issue requiring work** (L2 hardware SPL issue!!)

Few (combined) promising solutions:

- ✓ Using a dedicated 2nd PC running in parallel (to be exploit)
- ✓ SL3 Mask Section (reducing data volume)
- ✓ Event/s Truncation: data number threshold⇒stereo confirmed by defaul ⇐ (Laura, Edoardo)

Conclusion

- L2cal project success.
- HTTF work based on L2Cal and XFT Upgrades (G. Cortiana, M. Casarsa and others)
- Ongoing projects : GigaFitter, XFT